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INTERNAL CESOPHAGOTOMY.

THE DIVISION OF

MEMBRANOUS OR CICATRICIAL CONSTRICTIONS OR OBSTRUCTIONS IN THE CESOPHAGUS BY INTERNAL SECTION.

BY

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FELLOW OF THE AMERICAN LARYNGOLOGICAL ASSOCIATION, MEMBER
OF THE AMERICAN MEDICAL ASSOCIATION, OF THE MEDICAL
SOCIETY OF THE STATE OF NEW YORK, OF THE CENTRAL
NEW YORK MEDICAL ASSOCIATION, ETC.

*Reprinted from THE MEDICAL RECORD, November 11 and
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INTERNAL CESOPHAGOTOMY.¹

THE few operations of internal cesophagotomy that have been performed have given results that are very gratifying, when compared with the unsatisfactory results in most cases of dilatation, as well as of external cesophagotomy and gastrotomy, and notwithstanding accidental complications which sometimes unavoidably arise, the operation must take its deserved place among the operations in the cesophagus.

The published statistics of the operation show that it has been performed fifteen times. Eight times in France: first, by Maisonneuve, three times; after, by Lanelongue, once; Dolbeau, twice; Trélat, once; and Tillaux, once. Three times in Germany: Schiltz, twice, and Czerny, once. Once in Denmark by Studsgaard. Once in England by Mackenzie, and twice in the United States in the following cases.

Mrs. F. C. Robinson, of Spencerport, N. Y., aged twenty-four years, the wife of a druggist, was brought to me by Dr. P. G. Udell, her family physician, October 27, 1881, for consultation concerning a stricture of the cesophagus, from which she was suffering. The cause of the stricture was unknown. She first felt an uncomfortable sensation or obstruction in the lower part of her throat in February, 1874, after a violent paroxysm of laughter, but at that time had no difficulty in deglutition.

The dysphagia occurred quite suddenly one day during the following June. She first experienced difficulty in swallowing liquids and solids; semi-

¹ A portion of this paper was read before the Medical Society of the State of New York at Albany, February 8, 1882.

solids could be swallowed more readily. Soon it became almost impossible for her to swallow any substance but chocolate. This she could get down very slowly, and on this she sustained herself, though in quite a weakened condition. All solids and all other liquids would be returned shortly after taken.

In January, 1878, a severe form of stomach trouble came on, attended with vomiting of more or less blood, being due, it was thought, to ulcer of the stomach. Soon it became impossible for her to swallow any substances whatever, necessitating the employment of nutritive enemata to sustain her. This condition continued until the following June, when she was again able to resume her chocolate. At the beginning of the difficulty all substances which she could not swallow would be returned at once, but after a time they began to be regurgitated less quickly, until she could take half a glass of water or other substance and retain it for several minutes. This indicated the formation of a sac above the stricture, and from the walls of this sac undoubtedly much nutriment was absorbed—chocolate being the only substance which appeared to pass into the stomach, though very slowly and with difficulty. This condition continued until she passed to the care of Dr. Udell, May, 1881, who diagnosed the stricture of the œsophagus.

I should remark here that no previous diagnosis of stricture of the œsophagus had been made. The apparent gastric irritation was ascribed to indigestion or dyspepsia, hysteria, gastric ulcer, etc.

Dr. Udell at once began systematic dilatation of the stricture with flexible conical œsophageal bougies, and pursued it assiduously, but with very discouraging results. The tissue composing the stricture seemed to be of an elastic character, so that no matter how widely the opening was dilated it would return again almost immediately to its previous calibre, and no improvement in swallowing would follow. On exploration with a bulbous sound the stricture was found to be in the superior portion of the tube, about three inches (75 mm.) below its upper orifice. It was about half an inch (13 mm.) in extent, evidently a ring of elastic tissue. The

opening was so small that only one of the smallest olive points (4 mm. in diameter) could be passed without using considerable force. Just above the stricture on the left side of the œsophagus was found a sacculated dilatation into which the sound readily slipped, if it was not strongly directed toward the right side.

I advised Dr. Udell that this was a case very favorable for the operation of internal œsophagotomy. Accordingly, at the request of the patient, the operation was decided on.

Through the kindness of Dr. Morell Mackenzie, I procured of Mayer & Meltzer, London, an internal œsophagotome, made after Dr. Mackenzie's improved plan, having but a single cutting blade, as shown in Fig. 1. The shaft of the instrument is fifteen inches (38 ctm.) long, made of gum elastic and flexible. Through the centre of the shaft runs a stem, which is attached to the blade at the lower end of the instrument. When the instrument is introduced the blade is concealed in the metallic shield, which is firmly attached to the lower end of the shaft.

The distance which the blade is thrown out is regulated as desired by a screw in the handle.

December 7, 1881.—I divided the stricture by making a single incision through the posterior side. I was at once able to pass very easily a bulbous bougie, No. 18, English scale. There was very little hemorrhage at the time, but some slight bleeding followed during the afternoon, and clots of blood were vomited. The pain from the operation was very slight. The sensation, the patient said, was like a sharp sting or the scratch of a pin. The patient was ordered to abstain from taking any food by the mouth for two days, in order to exclude the irritation which the passage of the food and the *débris* lodging in the wound might cause. She returned



FIG. 1.—
Internal
Esophago-
tome, after
Mackenzie.

to her home, and the next day after the operation, Dr. Udell began the use of bougies to keep the opening free, and to prevent the recontraction of the stricture.

For a day or two after the operation she suffered considerable pain in the chest and in the region of the stricture, and some soreness followed for three or four days on the introduction of the dilating bougies.

On the fifth day after the operation I received a note from Dr. Udell, stating that the patient was doing finely, and that he had passed without difficulty the bougie of the third size (14 mm. diameter). Liquid food passed readily into the stomach and was retained; and this had not occurred before in seven and a half years.

The stricture was then dilated three and four times each day with No. 2 (17 mm. in diameter), the next to the largest size of the bulbous bougies; but notwithstanding this, after a time the stricture began to give indication of recontraction, it becoming difficult to pass the No. 2 bougie which had passed easily before; and the swallowing of liquids became more difficult.

Accordingly, January, 1882, I repeated the operation, making two incisions, one in each side, laterally, but not quite as deep as the previous incision. There was no hemorrhage of consequence this time, and but very little pain or soreness on passing the dilators. The stricture now appeared to yield entirely, and in three or four days it was dilated to the full size of the normal calibre of the œsophagus without difficulty, and the patient began to take solid food.

At the time of the second operation, I became convinced of the inefficiency of the ordinary bulbous bougie for dilating purposes. In addition to this, difficulty is often encountered, after they have passed the stricture, in withdrawing them, because of their shape, being like an egg, conical at the distal end, and quite blunt at the posterior end. I therefore had some dilators made in six different graduated sizes, of hard rubber, cylindrical, tapering at both ends alike, and securely fastened to a whalebone stem (see Fig. 2). These I found to be an ad-

mirable improvement, as they could now be held in the stricture for a short time at each introduction, giving the benefit of pressure, with the advantages of which in overcoming such conditions all are familiar. The tolerance of these bougies by the œsophagus gradually increased, though their pressure against the larynx interfered with respiration and prevented their long retention within the stricture; while conical rubber or gum-elastic dilators

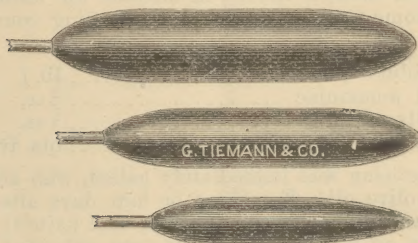


FIG 2.—Cylindrical Œsophageal Dilators.¹

of the same size cause such obstruction to respiration, by closing the laryngeal opening, as to necessitate their withdrawal at once.

With a stricture in the lower or middle portion of the œsophagus, this obstruction to respiration would not be encountered, and the instrument could soon be retained for a considerable length of time. The tolerance of an instrument by the œsophagus is shown by Krishaber¹ in cases of disease of the œsophagus, where a stomach or feeding tube was retained continuously in different cases, from forty-six to three hundred and sixty-five days.

This plan of keeping the opening free and preventing a reunion of the cut surface, has worked admirably, as there is now no perceptible tendency to reclosure or narrowing of the passage, and the patient takes all kinds of food freely. At first considerable food would lodge in the sac, and when this

¹ De la sonde œsophagienne à Demeure. *Ann. des Mal de l'orielle, du larynx*, p. 265. Paris, November, 1881. Also, *Transactions of the International Medical Congress*, London, 1881, vol. ii., p. 392.

was full it would be regurgitated, as before the operation, giving the appearance of vomiting from gastric irritation; but now the sac is gradually decreasing in size, and there is a corresponding decrease in this vomiting.

CASE II.—Carlton A——, aged eight years, son of a lumber dealer of Rochester, was brought to me, January 25, 1882, for advice concerning a stricture of the cesophagus.

Sixteen months before, in mistake for water, he drank some washing fluid of the following composition :

Babbit's potash.....	lb. j.
Sal ammoniac.....	$\frac{3}{4}$ ss.
Salts of tartar.....	$\frac{3}{4}$ ss.
Water.....	qts. iv.

A physician was immediately called, who administered olive oil. For three or four days after his throat and stomach were irritable and painful, particularly on swallowing. This soon subsided, and for two weeks he had no difficulty in swallowing, and was considered well. He then began to have more or less dysphagia, which increased until about November 1st, when he could only swallow liquids, and these with some difficulty.

Dilatation of the stricture was now begun with a very small gum elastic bougie, a much larger one could soon be passed, and swallowing was so much improved that liquids could be taken readily and some solids for a short time.

The dilatation was now continued, though only once in two weeks, but in the fall of 1881 marked dysphagia came on, and at times it was almost impossible to swallow anything, even milk.

This condition continued until I saw him. He was then much emaciated and very weak.

Examination revealed an obstruction, as had been stated by the father, in the lower end of the cesophagus, through which I was unable to find any opening, even to pass the finest filiform bougie, with the patient under ether.

Every second or third day I repeated these unsuccessful attempts at finding a passage, until it seemed useless to continue them longer, but, remembering

how others had succeeded in similar cases when about to abandon them, I concluded to try just once more, and, March 26th, was successful in getting through a fine filiform bougie, tipped with a metallic point. This I followed with slightly larger ones until the opening would admit a bulbous-pointed bougie, No. 18, English scale. With a flexible, conical bougie I could stretch the opening much wider, but it would contract again to the above size. Continued attempts at enlarging the opening by dilatation proved futile; therefore, June 2d, I performed internal œsophagotomy by making a single incision in the posterior side, that shown by the one-sided bulbous bougie, in Fig. 3, to be the deepest. There was no bleeding, the saliva being scarcely tinged with blood. Soon after the incision I began dilating again. The third day after I made a second incision in the right side as before. I repeated these incisions at intervals of four or five days, until I had made six in all, and



FIG. 3.

continued the dilatations. The opening is now permanently free, sufficient to admit a bougie 15 mm. in diameter, and swallowing is unobstructed. With improved deglutition the little fellow began to gain rapidly in flesh and strength, and to grow fast, and is now a stout and healthy boy.

The last operation previous to these just reported was done by Dr. Morell Mackenzie, of London, July 12, 1881.

I am able, through his courtesy, to present the record of the case as reported by him on the presentation of the patient at the clinical demonstrations before the Laryngological Section of the International Medical Congress, London, August 4, 1881.¹

"Henry Alexander, aged thirty-six; ship-rigger, while engaged at work, September 17, 1880, drank, in mistake for water, some of a clear solution of potash (used for removing paint, etc.). He was at

¹ For notice of the case, *vide* Transactions of the International Medical Congress, London, 1881, vol. iii., p. 332.

once admitted into the London Hospital. For three weeks he had ice to suck, and was fed by nutritive enemata. At the end of nine weeks a fine bougie (No. 1 or 2) was passed. After the lapse of thirteen weeks, with progressive dilatation of the stricture, he was enabled to eat fish. About the middle of February, 1881, he somehow caught small-pox, and was transferred from the London to the Small-pox Hospital, where he remained under treatment for four weeks, during which time no special attention was directed to the throat. On convalescence he returned as an out-patient to the London Hospital, but by that time had retrogressed in regard to swallowing, being able only to take jelly. He was admitted into the Throat Hospital, April 7, 1881, in a very debilitated condition.

"About the beginning of May, after use of ice, No. 4 bougie was passed. The stricture was found to commence at a level rather below the cricoid cartilage, the bougie then passing through a slightly tortuous track, deviating from right to left.

"Progressive dilatation was made, so that, by June 2d, a No. 8 could be got through the stricture; from this time progress became increasingly difficult. A graduated bougie was used, but by July 8th an advance of one size only had been made.

"Internal œsophagotomy was performed by Dr. Mackenzie on July 12th, the stricture being divided from below upward, in middle line, behind. No anæsthetic was administered. No. 14 bougie was passed without difficulty a few hours afterward. There was little pain after the operation, but this increased considerably toward the evening; it was referred to the stomach and to the back, and became severe enough to need a hypodermic injection of morphia to relieve it.

"On auscultation of the region to which pain was referred in the back (corresponding to the base of the right lung), fine crepitation on expiration and inspiration, with diminished breath-sounds, was found. Temperature, 100°; respiration, 40.

"July 13th.—Patient complains of very sharp pain on swallowing. Crepitation extending from right base to angle of scapula; diminished percussion resonance at lower part; slight, colorless, viscid expectoration.

toration. During the next few days the pulmonary signs became more marked; expectoration more profuse, but retaining the same characters. Patient has milk, eggs, beef-tea, and port (3 oz.), taking these well; some diarrhoea. Pains in stomach and right side more or less constant, increasing toward evening; obvious dyspnoea on slight exertion; spongio-piline, sprinkled with spts. tereb., for relief of pain, together with hypodermic injection occasionally at night.

"July 22d.—General condition fairly good; bougies 7, 8, and 9 passed.

"July 23d.—8, 9, and 10 passed. An expectorant mixture ordered. On successive days bougies were passed, similarly progressive in size.

"August 1st.—No. 15 passed easily; pain as before, but coming on only toward evening; less expectoration; crepitation still audible at right base. Temperature from time of operation has averaged in the evening a little above 101°, and in the morning a little below 100°. The patient died in the London Hospital about the middle of October.

"*Post-mortem.*—Both lungs were found considerably congested, and presented patches of pneumonia. The right pleural cavity contained a large quantity of sero-purulent fluid. Commencing about one inch below the cricoid cartilage, and extending downward for three inches, the walls of the oesophagus were found to be slightly thickened, hard and uneven on the inner surface, the lumen of the gullet being considerably narrowed for that extent. At the lower part of the stricture an incision of about an inch long was found extending through all the coats of the tube below, and through the mucous and part of the muscular tunic for the upper half of its length. The wound showed but little sign of cicatrization."

The unfortunate termination of this case Dr. Mackenzie largely attributes to the patient being a confirmed drunkard, as it was found impossible to keep him from taking spirits in large quantities.

Considering the slight attention which the operation of internal oesophagotomy has received at the hands of our surgical authors and the absence of any article on the subject in English that I am aware of, a review of all the cases, in which the operation has

been performed, cannot but be of interest as well as profit. By studying its past record, its successes and failures, we can judge correctly, and without prejudice, its merits and demerits—facts rather than theories should govern our judgment.

CASE I. (By Maisonneuve).—A young girl, in a fit of despair, swallowed a quantity of sulphuric acid, which produced an inodular stricture in the vicinity of the cardia, 3 ctm. long. (Esophageal bougies were introduced, and the patient nourished for a time by nutriment injected through them into the stomach. Notwithstanding the introduction of the bougies, the stricture continued to contract until it became impossible to introduce the bougies and for the patient to swallow even liquids in sufficient quantities to sustain her. She was greatly reduced in flesh and strength, and in immediate danger of starvation. Maisonneuve having just read a paper before the academy on internal urethrotomy, conceived the plan of dividing strictures in the œsophagus in the same manner. Accordingly he had an œsophagotome made by Charrière after the plan of his well-known urethrotome, only adapted to the œsophagus by being longer and thicker. It has two independent blades, sliding each in a groove on the outside of the stem, the point of which is tipped with a slender, flexible guide. The length of the instrument is 50 ctm. The blades are each 12 mm. wide, their cutting edge occupying only the anterior third, the other two-thirds being entirely blunt. To each of the blades is attached a long steel stem, provided with a button for working it, either alone or together with the other blade.

In using the instrument it is first carefully introduced through the stricture guided by the flexible point. Then one of the blades is introduced into the groove and gently pushed downward, severing the stricture. The second blade is introduced if required.¹ July 16, 1861, he made a double incision through the stricture from above downward, unattended by pain or hemorrhage. On the following day the patient could swallow bread, eggs, and

¹ For illustration of this instrument, vide *Lehrbuch der Chirurgie*, von Dr. Eduard Albert, 1881, p. 542.

meat freely. On the eighth day subacute peritonitis supervened, and death occurred on July 31st.

At the autopsy there was absolutely no inflammation of the œsophagus or of the surrounding cellular tissue. The stricture showed a perfectly clean mark of the scarification, confined entirely to the morbid tissue, which had been but incompletely severed. There was no lesion of the stomach, but there was an intense peritonitis, the origin and source of which was entirely unknown, though the cause seemed to be in the pelvis.

CASE II. (By Maisonneuve).—That of a young woman with stricture in the œsophagus, just below the thyroid cartilage, caused by tuberculous infiltration. For three months the patient had been unable to swallow sufficient liquid food to sustain her, and she was almost moribund. It was impossible to pass the smallest sound. On July 20, 1861, with much difficulty and the exercise of considerable force, a fine whalebone bougie was passed. This was followed by a flexible bougie screwed to the stem of the œsophagotome, which was introduced through the stricture, and section of the stricture was made from above, downward. After the operation a large sound could be passed easily, and the patient could swallow food readily. Four days afterward she was attacked with acute peritonitis, and died August 1st.

The conditions revealed at the autopsy were almost identical with those of the former case. A slight mark of the incision through the tumor was found, but no inflammation in or about the œsophagus. Intense inflammation, with exudation, in the abdominal cavity. In both cases the stomach was examined to ascertain if a perforation had been produced, but none was found. Braun¹ suggests that there might have been one, too small to be seen on simple inspection, that caused the inflammation, but this seems highly improbable.

CASE III. (By Maisonneuve).—M. C—, a man fifty-eight years old, had experienced for two years great difficulty in deglutition. The cause of the stricture was unknown. It was located at the junc-

¹ Czerny's Beiträge zur Operativen Chirurgie, 1878, p. 86, note.

tion of the upper and middle third of the œsophagus, and had gradually contracted to such an extent that only soup and thin broth could be swallowed.

April 3, 1862.—Two incisions were made through the stricture, when immediately afterward an ivory ball, $1\frac{1}{2}$ ctm. in diameter, could be passed without difficulty. The pain attending the operation was very slight, and there was very little loss of blood. The same evening the patient could eat bread and meat. Eight days after, no accident having occurred and deglutition remaining good, the patient departed for the province and nothing more was heard from him.¹

A fourth case of stricture of the œsophagus is reported by Lanelongue to have been given by Maisonneuve in connection with the above three cases, but on an examination of Maisonneuve's original article, the case is not to be found reported there.

As the case is undoubtedly authentic, and the reference wrong, I will cite it from Lanelongue.² It is to be excluded, however, from the operations of internal œsophagotomy, as the operation was only attempted, but never performed.

"Besson, fifty-seven years of age, was admitted to the hospital, May 1, 1865, with a cancerous stricture near the cardia. Food was regurgitated immediately after taken. Internal œsophagotomy was proposed, but after many fruitless attempts at introducing the œsophagotome the operation was abandoned.

"May 20th.—An œsophageal sound was introduced, it was believed, into the stomach, and broth and herb decoction was injected, which passed without difficulty. Immediately after, there was anxiety, sharp pain in back, cold sweats, extreme lividity, pulse small and frequent, and death followed next day.

"At the autopsy emphysema and liquid was found in the posterior mediastinum. Perforation of the œsophagus four or five centimetres above the cardia,

¹ For report of above three cases vide Maisonneuve, J. G., *Clinique Chirurgicale*, Paris, 1864, tome ii., pp. 409 et seq.

² Lanelongue: *Observation avec quelques considérations pour servir à l'histoire de l'œsophagotomie interne*. *Mémoires de la Société de Chirurgie de Paris*, 1865, tome vi., p. 555.

at the junction of the œsophagus with the cancerous tumor. This perforation was caused by the penetration of the sound. There was a cancerous tumor at the inferior extremity of the œsophagus, with infiltration along the lesser curvature of the stomach."

CASE IV. (By Lanelongue).¹—Patient twenty-three years of age; farmer; admitted at Hospital St. André, October 22, 1864. In November, 1853, in mistake for white wine, drank from a bottle some sulphuric acid. Excruciating pain in neck, breast, and stomach followed, and continued with fever and inability to swallow for eleven days. On the twelfth day a sound was introduced into the œsophagus, and broth was injected into the stomach. This was repeated for twelve consecutive days, when he was again able to swallow milk, broth, and even soup, and, after a time, solid food. For two years he experienced no other symptoms than slight pains after eating, but he now began to lose his teeth, and being unable to masticate his food, deglutition became difficult and painful. He now applied at the Hospital St. André, and for one month an œsophageal sound was introduced, with improvement. He then left, and was told to have the sound passed frequently, which he failed to do. After a time the dysphagia returned, and he was again admitted to the hospital in a greatly debilitated condition, spending most of his time in attempting to swallow. On examination, an impassable stricture was found just below the cricoid cartilage. After repeated unsuccessful attempts, a whalebone bougie, 1 mm. in diameter, was passed. The stricture was ascertained to be a cicatricial band 2 ctm. in length. Owing to the hardness and unyielding character of the stricture, progressive dilatation failed to give relief.

Not knowing of Maisonneuve's previous operations, Lanelongue conceived the plan of dividing the stricture as in internal urethrotomy, and had a urethrotome modified to the œsophagus. It consists of a metallic stem, hollow and curved, armed with a concealed blade near its inferior extremity. This blade is half elliptical, and can be thrown out $1\frac{1}{2}$ ctm. It is hidden in the "opercule" when intro-

¹ Lanelongue : Loc. cit., p. 448.

duced, and can be thrown out either above or below it. To the lower extremity of the instrument is attached a conducting bougie to facilitate its introduction. This is made of whalebone, and has an olive point 1 mm. in diameter. On November 8, 1864, Lanelongue performed the operation by passing the stem of the instrument through the opening and sliding the cutting blade from above downward through the stricture. The instrument was then turned and two other incisions made. The operation was painless and almost bloodless. No reaction and but little pain on deglutition followed for two or three days. There was immediate improvement in deglutition, and the patient was enabled and continued to take solid food freely. Dilatation soon restored the œsophagus to its normal calibre, which continued at the end of a year, when he was last seen.

CASE V. (By Dolbeau).—A young girl had, eighteen months before (in October, 1868), tried to commit suicide by swallowing sulphuric acid. Dysphagia was so great that she could only swallow broth and milk. After many unsuccessful attempts, Dolbeau succeeded, at the end of eight days, in passing the smallest of the graduated series of olive bougies, mounted on a whalebone stem made by Charrière. By progressive dilatation, the stricture could only be enlarged to five or six millimetres. Division of the stricture was then decided on by Dolbeau, and performed with an œsophagotome made by Messrs. Robert & Colin. It consists of a ball 6 mm. at the base, terminating conically, containing two concealed blades, which are regulated by a mechanism in the handle of the instrument. The divergence of the blades is exactly limited to the diameter of the ball, so as to prevent them from passing beyond the limits of the cicatricial tissue. The operation was made by passing the olive beyond the stricture, when the blades were thrown out and the stricture divided as the instrument was withdrawn. The operation was painless and bloodless. Dilatation was then resumed, and 1 cm. was soon reached, when deglutition was rendered normal.

CASE VI. (By Dolbeau).—In the year previous (1869) Dolbeau had another patient, on whom he

operated for internal œsophagotomy in the Hospital Beaujon. In this case the dysphagia dated back two years, and was also the result of swallowing sulphuric acid. After progressive catheterization and dilatation, five or six millimetres only could be attained, which decided him to perform internal œsophagotomy, as in the previous case, and it was done with the same result. A dilatation of 1 ctm. was rapidly reached after the incision, allowing complete alimentation. There was no pain or hemorrhage in this case, as in the previous one, and, on being dismissed from the hospital, she was advised to make daily use of the sound.

The above two cases were reported to the Société Impériale de Chirurgie, March 16, 1870.¹

CASE VII. (By Trélat).—A man, thirty-one years of age, came under the charge of Trélat, at La Pitié, October, 1869, with stricture of the œsophagus, caused by drinking, May 26, 1867, in mistake for water, a glass of dilute nitric acid ("un verre d'eau second"). Violent pain followed immediately, with vomiting of black and pure blood. The next day he was relieved. Three weeks later, solid food began to be swallowed with difficulty and sometimes regurgitated. Dysphagia increased; soon liquids only could be taken with great difficulty, sometimes not for twenty-four or thirty hours.

October, 1867.—The patient sought admission at the Hospital Lariboisière, under the care of M. Verneuil. After eight months of continuous dilatation of the stricture with an ivory ball bougie, he was able to swallow very well, even some solid food, and he left the hospital; being advised, however, to use the sound very often, which he failed to do.

Dysphagia soon reappeared and he sought re-admission at the hospital, July, 1869. Dilatation was again renewed, but without ameliorating the condition of the patient. An operation being evidently necessary, the patient was sent to M. Trélat. All substances taken would be retained for a few moments and then regurgitated, indicating a sac above the stricture. Very little would pass through the opening, which would only admit an olive 8 mm. in

¹ Dolbeau; Gazette des Hôpitaux, Avril 5, 1870, p. 159.

diameter. The stricture was 35 ctm. from the incisors and 1 ctm. in length. It was of an elastic, movable character, as the distance to the upper side, on passing the olive downward, was greater than to the lower side, when the olive was withdrawn. The patient's condition now became extreme, requiring active operative interference—either divulsion of the stricture, external œsophagotomy, gastrotomy, or internal œsophagotomy. The latter Trélat decided on, as the stricture was too low for external œsophagotomy. The instrument used was made by Robert & Colin, and has a total length of 60 ctm. It consisted of a graduated stem 42 ctm. long, a handle 12 ctm. long, and a terminal stem or guide 6 ctm. long, having an olive point 4 mm. in diameter. At the junction of the stem with the shaft is a half-flat bulb. Below this bulb are two blades concealed, which are thrown out, by a screw in the handle, after the instrument has penetrated through the stricture to the bulb, and the incision is made by withdrawing the instrument.

On December 2, 1869, Trélat made the first incision with the blades separated 15 mm. There were but a few tinges of blood and only a light sensation of pain in the region of the xiphoid appendix for two days after. The next day the patient could take finely chewed, solid food. Six days after, an olive, 9 mm., could be passed, and on the seventh, 10 mm.; beyond this the stricture could not be dilated.

December 16th.—A second incision was made with the blades separated 18 mm. Result as after the first incision. But little improvement followed this incision, owing, Trélat thought, to the dulness of the point of the blades.

December 31st.—A third incision was made with the blades separated 2 ctm., and sharpened to the point. No pain attended this operation, but almost immediately after the patient vomited a glassful of blood, and next day the stools were darkened with blood. With absolute rest and very cold drinks, the hemorrhage was arrested and the patient was very comfortable, excepting a soreness at the seat of the stricture on the passage of food.

January 11th.—Hemorrhage recurred, caused by

straining in defecation, and again, the next day, losing about four hundred grammes. This was again checked, but the xiphoid pain continued and the patient was very weak.

January 17th.—Another slight hemorrhage without cause. Shortly after this, on taking wine or alcoholic potions, there occurred violent paroxysms of coughing, with expulsion of food and a prolonged burning pain in the region of the incision, indicating œsophagitis in this portion of the tube. On the withdrawal of wine and alcoholic potions and all irritating substances, the cough and pain subsided, and with a nutritious diet of milk, broth, and thickened potage, he regained strength and color.

February 15th.—Dilatation was resumed and an olive, 11 mm., then 12 mm., was passed. Now, instead of an annular obstacle on passing the olive, a sensation of a series of nodosities is felt.

February 28th.—No more regurgitations of mucus or food, and the patient takes all kinds of food freely and normally. Improvement continued, and, March 25th, an olive, 13 mm. in diameter, could be passed, and the patient was feeling extremely well.

(The above case by Trélat was reported to l'Académie de Médecine, March 8, 1870.¹)

CASE VIII. (By Tillaux).²—A saddler, forty-eight years of age, was admitted to Hospital St. Louis, under the care of Tillaux, October 15, 1872.

Ten years before, while in Mexico, in mistake for brandy, he took a caustic liquid, the nature of which he did not know. It caused a sensation of heat behind the sternum for a few hours, which he would have forgotten had it not been followed by dysphagia and occasional violent spasms of the œsophagus, when it was impossible for him to swallow anything.

During the following year dysphagia gradually increased, until he was obliged to abandon all solid food, and at the time of admission to the hospital it

¹ Trélat, U.: Sur l'œsophagotomie interne dans les rétrécissements cicatriciels de l'œsophage. Bulletin Général de Thérapeutique Médicale et Chirurgicale, Paris, 1870, tome 78, p. 252. This article also contains an illustration of Trélat's œsophagotome.

² Tillaux: Contribution à l'histoire de l'œsophagotomie intern. Bulletin Général de Thérapeutique Méd. et Chirurgicale, Paris, Janvier, 1873, tome 84, p. 14.

was with the greatest difficulty that he could swallow liquids in very small quantities; these he would attempt to force down by making pressure downward along the neck. He was now very weak and much emaciated. On exploration, Tillaux found a stricture at the union of the pharynx and the œsophagus, through which only the smallest olive could be passed. Catheterization and dilatation were now tried for twenty days without any increase in size of stricture, and, on November 5th, Tillaux incised the stricture with Trélat's œsophagotome, having first determined the extent of the stricture with the olive bougie. The section was made from below upward, with a lateral projection of each blade 1 cm. There was no pain, and only a streak of blood in the saliva. Immediately after the operation the first four olives of the series could be easily passed. There was no subsequent hemorrhage, and only a slight pain in the right lateral part of the neck.

On the fifth day the fifth olive, and on the eighth day the sixth olive, the largest of the series, were passed, which was a little larger than the normal calibre of the œsophagus.

December 8th.—Stricture considered cicatrized, and the patient eats freely as before the accident in Mexico, and he is regaining his flesh and strength rapidly.

CASE IX. (By Studsgaard).¹—Hilga R—, aged eight, was admitted to the Children's Hospital (Copenhagen), June 30, 1873. Twelve weeks previously, in mistake for water, she had drunk from a bottle a mouthful of a solution of lime and potash, used for washing. Pain in the chest and vomiting followed immediately. Swallowing became difficult, and liquids only could be taken. Treatment by dilatation with elastic catheter was attempted, but it could not be forced through the stricture, and after each trial she brought up some blood. She was getting thin, and spat and hawked up quantities of slime. She could swallow milk without difficulty, and soup and softened bread-crumbs in small

¹ Studsgaard, C. : *Cœsophagotomy interna ved Cicatriciel Strictur*, Hospitals-Titende, p. 173. Kjöbenhavn, October 29, 1873.

quantities. After a few days she could not swallow anything.

July 9th.—Bulbous bougie No. 10 (Charrière bougie) passed through the stricture.

July 12th.—Nos. 12 and 13 passed through. A roughness or scratching was felt by the patient when the bougie passed the stricture. After this she could swallow crusts of bread in small pieces, and blood did not show itself in passing the bougie. After this her condition was variable.

August 16th.—No. 10 went through with difficulty. Stricture was getting longer and harder, and a few places above the first stricture were found narrowed.

September 2d. — Studsgaard had the good fortune to get No. 11 through again. The patient grew paler and thinner.

September 16th. — Internal œsophagotomy was performed by Studsgaard with an instrument having a concealed two-edged cutting blade,¹ much resembling Maisonneuve's instrument, having an elastic point answering to No. 11. The upper end of the stricture was 21 ctm. from the upper incisor teeth. With the head thrown back the instrument was introduced and the incision made from above downward. The knife met a strong elastic obstruction, but passed through freely, after which bougie No. 23 passed easily. She complained somewhat and brought up some blood, but was soon relieved. Two hours afterward she began to feel a severe pain in the cardia and back, which was relieved by throwing up some clear blood. Her voice got thick and she could only speak with difficulty, and three times in the afternoon there was much oppression in the chest and dyspnoea, so much so that she grew bluish red in the face, and it appeared as if she would suffocate. Raising her in bed relieved her, and there was no more vomiting.

September 17th.—Patient slept well during the night, and has pain only in the cardia on pressure and on moving. Voice about natural. Pulse, 90. Bowels moved, after an enema, without sign of blood. Bougie No. 23 passed through. No return of fever. Pain and sensitiveness disappeared altogether.

¹ For illustration vide Hospitals-Titende, loc. cit., p. 174.

September 29th.—She could eat crusts of bread, meat, potatoes, etc., and she was not required to take a drink after each mouthful. Bougie No. 27 stuck, but on the following day it passed further down.

October 6, 1873.—The patient was discharged from the hospital, with the advise to continue the treatment of dilatation. She had increased in weight from July 2d, 37.33 lbs.; to October 6th, 48.35 lbs.

After the above report was made the stricture was reported to have gradually returned, notwithstanding continuous dilatation, allowing only Nos. 14-15 to pass, and pockets had formed above the stricture.

Internal œsophagotomy was again performed with the same instrument.

June 5, 1874.—This was followed by dilatation, and at the time this record was made, an œsophageal bougie, of a diameter "2 mm. larger than No. 28," could be passed easily.

Cases X. and XI. were reported by Schiltz¹ to the Society of Physicians at Cologne, December 12, 1876, as cases on which he had performed internal œsophagotomy several years before. An instrument was employed, devised by himself, after the manner of a urethrotome. A description of the instrument will not be published until after the passage of the German patent law.

CASE X. (By Schiltz).—That of a woman who had suffered for months from a difficulty in swallowing from a carcinomatous stricture of the œsophagus. Treatment by dilatation being ineffectual, internal œsophagotomy was performed. Pain and hemorrhage was insignificant. The patient was enabled to swallow meat and bread, and a large sound could be passed into the stomach. Gradually, however, the stricture contracted again, so that after several weeks the incision had to be repeated, which was followed by the same successful results. Altogether the incision was repeated five times without

¹ Schiltz: *Correspondenzblatt der ärztlichen Vereine in Rheinland, Westphalen und Lorchingen*, 1877; April, W. 19 S. 19, also vide Braun's article, *Œsophagotomia Interna*, "Czerny's Beiträge zur Operativen Chirurgie," 1878, p. 70 et seq., which contains an excellent review of all the cases to that date, and from which these two cases are taken, owing to the failure of the writer to obtain a copy of Schiltz's original article.

pain or hemorrhage, but always with transient success. The patient finally died from tuberculosis which had existed for a long time, life having been sustained by means of the sound to the very last. No autopsy was made.

CASE XI. (By Schiltz).—This patient had an œsophageal stricture, thought to be the result of a cicatrized ulcer, which had been produced by strong brandy. In this case, too, the dilatation was unsuccessful and œsophagotomy was resorted to. After the operation, which had caused no small amount of pain, a large sound could be introduced one inch deeper, but not into the stomach, but a smaller sound passed through and revealed a second deeper stricture. Inasmuch as after the operation the patient had hemorrhage, lasting for five hours, which could not be checked by chloride of iron or by sounds retained *in situ*, incision of the second stricture was refused. Death occurred eight days later from increasing failure or exhaustion of the vital powers.

At the post-mortem the incision was found cicatrized, and near it a narrow stricture occupying the cardia, through which a thin lead pencil could be passed with but little difficulty. Schiltz regrets not having recognized the two strictures at first, so as to have incised them both at one sitting. In his opinion this case would then have been cured by the operation.

CASE XII. (By Czerny).¹—A girl, eight years of age, was admitted to the Surgical Clinic, Heidelberg, February 20, 1877, with stricture of the œsophagus, caused by the accidental swallowing of lye ten months previous. The only history obtainable was, that since that time difficulty in swallowing had gradually increased, until only liquids could be swallowed slowly and in small quantities.

When admitted the little patient was pale and emaciated. Upon introducing the œsophageal sound a narrowing of the œsophagus was encountered 18 cm. from the incisor teeth, about opposite the manubrium sterni, into which an elastic catheter, 4 mm. in diameter, was introduced without difficulty. Pushing the instrument further on, it became tightly engaged,

¹ Czerny's Beiträge zur Operativen Chirurgie, loc. cit., p. 70.

so that a reliable opinion as to the extent of the stricture could not be obtained. Other organs healthy. The stricture was now dilated daily with conical œsophageal bougies, and, March 6th, a sound, 6 mm., could be passed, and liquids, farinaceous food, and soft bread could be swallowed.

March 25th.—Catheter, 7 mm., passed. Finely cut meat could now be swallowed, and the nutrition of the patient much improved.

April 8th.—Child dismissed at request of the parents.

May 16th.—Child readmitted. Return of the dysphagia. A bougie, 5 mm. in diameter, could only be passed with difficulty. Several strictures, "shelves of membrane," were now found—the lowest, the smallest. Tin sounds of Billroth were now used, but they could not be retained for any length of time, owing to pressure against the larynx; and more or less pain in the throat was produced. Continuing the progressive dilatation, the limit of dilatation was not only reached, but the stricture soon began to grow smaller.

May 29th.—It was no longer possible to introduce the thinnest tin sound, and only an elastic bougie, 4 $\frac{8}{10}$ mm. in diameter, could be passed, even under anæsthesia.

June 9th.—Attempts to dilate stricture with Jameson's dilator failed. All attempts at dilatation having failed, Professor Czerny performed internal œsophagotomy with an œsophagotome, patterned after Ivanchich's urethrotome, only much longer. Patient under an anæsthetic. The stricture was divided from below upward, once to the right and once to the posterior surface, the blade projecting 2 mm. Only a trace of blood seen in the mucus. Immediately after bougies 8 and 10 mm. in diameter passed easily. After recovery from the narcosis there was only slight pain, but several times violent vomiting. In the evening the neck became swollen from the clavicle to the region of the larynx. For the next few days the emphysema increased, until the whole neck from the lower jaw to the clavicle was decidedly tympanitic, and painful on pressure; and swallowing was performed with difficulty. Temperature, 38 $\frac{6}{10}$ ° C. to 39° C.

From June 17th emphysema subsided, and by 19th was gone. Only fluids and two raw eggs taken daily.

June 21st.—Diphtheritic deposit upon tonsils and swelling of cervical glands. Chlorate of potash locally and internally. Constant pain in throat, though deposit did not extend. Marked dyspnoea. Without special symptoms, patient gradually failed, and died June 24th, 4 A.M.

Autopsy by Professor Arnold.—Considerable swelling of lymphatic glands of neck. Diphtheritic deposit and filtration of soft palate and tonsils. An abscess was found between the œsophagus and spinal column, extending from the third cervical to the third dorsal vertebræ. Opposite the manubrium sterni it communicated with the pleural cavity on each side. At the fifth and sixth cervical vertebræ there was a wound in the posterior wall of the œsophagus 2 ctm. in length, having smooth-cut edges somewhat infiltrated.

The peri-œsophageal tissue the whole length of the œsophagus was swollen and infiltrated. In the lower third of the œsophagus the mucous membrane was deficient and replaced by cicatricial masses, and at several points large folds of cicatricial tissue. Here, also, there was an extensive communication between the lumen of the œsophagus and the peri-œsophageal abscess. Both pleural cavities contained ichorous pus, the pleural membranes were opaque, and both lungs highly compressed. Death, in this case, says Braun, must be attributed to section through the whole thickness of the walls of the œsophagus, which was followed by an abscess in the posterior mediastinum, which opened into both pleural cavities shortly before death. Perhaps the "fatal exit" was hastened by a diphtheria, which supervened a few days before death.

Case XIII., by Mackenzie, has been given.

REMARKS.—I have cited these cases of internal œsophagotomy more or less in detail, in many of them following the language of the author.

By so doing we are able to study them more closely, and to arrive at a more accurate opinion concerning the operation, its advisablnlity, the best method of performing it, its after-management, and

the complications which may arise and which are to be guarded against.

Out of the fifteen cases in which the operation has been performed, there were nine recoveries and six deaths; and but two of the deaths were a direct result of the operation.

In the first two cases by Maisonneuve there was no connection between the operation in the œsophagus and the peritonitis, as was shown by the autopsy.

To explain these singular coincidences, Maisonneuve asks, "if there is not between the peritoneum and the œsophagus one of those mysterious connections which exist between wounds of the head and abscesses in the liver, or between those terrible attacks of pernicious fevers and injuries of the urethra, which have so long puzzled the most scientific anatomists."¹

As no such sympathy between the peritoneum and the œsophagus appeared in the other thirteen cases, the fact that these two patients were both in the same hospital, and were both attacked by peritonitis on the same day, though operated on four days apart, and dying but one day apart, indicates quite clearly that the peritonitis was occasioned by a common ulterior cause.

In the two cases of Schiltz which terminated unfavorably the one in which the stricture was due to cancer could not be expected to recover, and only temporary improvement could result.

A similar case of cancerous stricture in the upper part of the œsophagus came under the care of the writer a short time ago. Though he was requested to perform an operation, and the case was no more unfavorable than the one of Schiltz, he refused, as there could be no permanent benefit, and discredit would be brought on the operation.

The operation in the second case of Schiltz was successful, so far as it went; but as it was incomplete from failure to divide the lowest and tightest stricture, the result must be considered negative, the same as if no operation had been attempted. Had all the constrictions been accurately determined

¹ Maisonneuve: *loc. cit.*, p. 413.

and carefully divided, the result would doubtless have been quite different.

In the two cases (Czerny's and Mackenzie's) where death ensued as a direct result of the operation, the cause was, in both instances, cutting too deeply and penetrating through the walls of the œsophagus.

These two cases should therefore warn future operators to exercise great care to guard against the occurrence of this almost inevitably fatal accident.

Method of performing the operation.—The operation in itself differs but slightly from internal urethrotomy; and the instrument used is essentially a urethrotome, modified and adapted to the œsophagus.

The instruments used by the operators since Studsgaard have had but one cutting blade.

The advantage of an instrument with but one cutting blade is at once apparent. With it, the side on which the stricture is deepest, as is sometimes the case, can be incised without wounding the opposite side, which may be thin and easily cut through. Also, the side against which external pressure may be exerted, can be avoided, as, by the crossing of the left bronchus, by the aortic arch, or by enlarged lymphatic glands, the resistance of which would increase the danger of penetration through the wall.

We see that in the operations by the more recent operators all the incisions have been made from below upward, which is considered by far the safer method.

The danger attending the incision of a stricture from above downward is not so great in the upper as in the lower portion of the œsophagus, for the reason that the portion of the œsophagus above the crossing of the left bronchus is more rigid, being bound down more firmly than the portion below. The lower portion being more yielding to allow for the great mobility of the diaphragm, and being more markedly curved as it passes forward to enter the cardiac portion of the stomach, would be liable to cause the instrument to impinge with greater force against the lower side and penetrate the œsophageal wall.

It is observed, however, that the only two deaths caused by the operation followed division of the

stricture from below upward. This was due, especially in Dr. Mackenzie's case, to the unfavorable condition of the stricture rather than to the method employed.

The limited number of operations and the great variations in different cases which have to be studied independently, prevent the establishing of a specific rule for performing the operation.

Notwithstanding this fact, it may not be amiss to detail briefly the general plan which the writer deems it safest to follow, and which is deduced from the reports of the previous operations and his own experience.

The œsophagus should first be thoroughly explored to determine its exact topographic-anatomical position, in relation to the location and extent of the stricture; the condition of its walls, if atrophied or thinned; the calibre of the stricture compared with that of the œsophagus above, and, if possible, below; and if the stricture be circular or located mainly or wholly on one side.

The exploration of the œsophagus is ordinarily best made with small olive-shaped balls, tapering alike at both ends, made of ivory or hard rubber, in different sizes, and mounted on a whalebone stem.

The writer has also a set of metallic bulbs mounted on a gum-elastic stem. These he finds of advantage in some cases, on account of their weight, as they will drop down the œsophagus by their own gravity, and, having a very flexible stem, will sometimes indicate the condition and location of a stricture more accurately than a light ball mounted on a whalebone stem, which is necessarily more or less rigid.

For determining the side on which a stricture is located or is the deepest, he employs an olive, which he has made with the bulb entirely on one side, as shown in Fig. 3, page 9. At the upper end of the handle is an indicator to show the side toward which the bulb is directed when introduced into the œsophagus. By passing the instrument gently down and up, each time turning it partly around, the side on which it meets with the greatest resistance will be indicated as the side on which the stricture is deepest.

After the condition of the stricture is accurately

determined, the depth to the upper and also to the lower side of the stricture is measured and marked on the stem of the œsophagotome, taking the upper incisor teeth as the point to measure from.

The œsophagotome is now introduced (the tongue being drawn gently out and held in a napkin), until the upper mark on the stem indicates that the blade has passed through the stricture. The blade is now thrown out and the instrument drawn out until the second mark shows that the blade has cut through the stricture, when it is thrown back and the instrument withdrawn.

If the stricture has been found to be deeper on one side, the blade is turned to that side. Should there be more than one stricture, it is advisable to determine the situation of each, and to divide them separately. If this cannot be done at one time each can be successively dealt with as the passage is cleared above.

In all cases an opening through the stricture must be found before an operation can be attempted, for in plunging a cutting instrument downward without a guide, the danger of making a false passage is apparent.

As in urethrotomy, the treatment of the stricture is by no means ended when the operation has been performed.

For a day or two after the operation the patient should be permitted to take only the blandest substances, in order to avoid irritating the wound. It may sometimes be better not to give anything by the mouth for two or three days, but to sustain the patient by nutritive enemata.

The following day after the operation, dilatation should begin. Without exercising force, the bougies should be gradually increased in size until the fullest extent of dilatation is attained. Should the opening be then insufficient to allow complete alimentation, the operation should be repeated.

In performing the operation it is far better and safer to make several shallow incisions at intervals, and follow each by dilatation, than to make one or two deep incisions at one time.

Afterward, notwithstanding the fact that nearly all of the cases operated on have been reported as

remaining" permanently cured, the precaution of occasionally having the bougie introduced should be urged, for, as in urethral strictures, there may remain some contractility of the tissue at the former site of the stricture which may cause it to return.

Indications for the operation.—In the treatment of œsophageal stricture the time-honored sound still maintains its recognized place, for it is only after a patient and thorough use of the sound has failed, and other means of alimentation have also failed, that resort to the operation of internal œsophagotomy is justifiable.

The assertion by Hüter¹ that all strictures through which a sound can be made to pass can be cured by dilatation is entirely disproved by these cases, for in each one it was only after the sound had completely failed that the operation was resorted to.

The operation of internal œsophagotomy is clearly indicated in all forms of stricture of the œsophagus caused by membranous or cicatricial formations. Membranous formations usually arise spontaneously, as was seemingly the case in the first patient operated on by the writer. They may also be of congenital origin.

Three cases of membranous contraction in the upper part of the œsophagus, supposed to be congenital, are reported by Zenker and von Ziemssen.

In all three the stenosis was located at the entrance of the œsophagus. In two cases it was a simple ring about the tube; in the third the canal was narrowed by membranous bands for a distance of eight millimetres.

Illustrative specimens, both of spontaneous and congenital membranous formations are preserved in the museum of the College of Surgeons, London.²

One (No. 1,079) shows a stricture of the œsophagus from a fold of mucous membrane. Just below the cricoid cartilage the œsophagus gradually contracts to half its diameter and then dilates. The mucous membrane, at the contracted part, forms transverse, sharp-edged, and projecting folds, which

¹ Jahresbericht über die Leistungen und Fortschritte in der gesammten medicin. von Virchow und Hirsch, 1873, Bd. II., S. 485.

² Ziemssen's Cyclopædia, vol. viii., p. 18.

³ Holmes' System of Surgery, London, second edition, vol. iv., p. 490.

pass around the chief part of the circumference of the tube.

Cicatricial formations are most commonly the result of swallowing some acrid substance, as sulphuric acid, nitric acid, lye, or caustic potash, though any substance sufficiently acrid to produce erosion or destruction of the mucous membrane will give rise to cicatricial formations.

Respecting the changes in the œsophagus which result from the swallowing of an acrid substance, Rokitsky remarks that when "mucous membrane has been destroyed by the energetic action of the poison, it is replaced by serous and sero-fibrous tissue, which gives rise to peculiar valvular strictures of the œsophagus, somewhat analogous to those consequent on dysentery."¹

Strictures will sometimes contract to a certain point and then remain stationary for many years without showing signs of further contraction and not requiring any operative interference. An interesting case of this character is reported by Easton.²

A man, aged twenty-five years, swallowed by mistake a corrosive liquid, which produced a stricture in the lower part of the œsophagus. He was unable to swallow any solid food, and being fond of milk and cake, he made them his exclusive diet, living upon them fifty-five years, and being able to perform laborious farm work.

Instances are also reported in which cicatricial strictures have yielded spontaneously when death from starvation seemed imminent.

Braun refers to two cases. One reported by Ashurst,³ where a stricture caused by swallowing lye, resulted in a spontaneous cure. One by Hutchinson,⁴ caused by swallowing caustic potash, in which gastrotomy had been proposed but not performed, also yielded spontaneously.

When, however, the stricture contracts notwith-

¹ Path. Anat., vol. ii., p. 10.

² Easton, C. M.: Chicago Medical Journal and Examiner, 1879, vol. xxxviii., p. 158.

³ Ashurst, S.: Stricture of the Œsophagus from Swallowing Lye. Am. Jour. Med. Science, 1870. p. 393.

⁴ Hutchinson, Jonathan: Case of Stricture of the Œsophagus after Swallowing Caustic Potash. Gastrotomy Proposed but not Performed. London Hospital Reports, vol. iv., p. 56.

standing the most careful and thorough use of the sound the operation of internal section should be resorted to while the opening is sufficiently large to admit the œsophagotome.

Even on a limited search through medical journals and hospital reports we shall find numerous instances recorded where patients have died from starvation with œsophageal stricture (or from external œsophagotomy, or gastrotomy, performed in the attempt to avert this result), when it was found on post-mortem examination to have been caused by narrow bands of cicatricial or elastic tissue, or membranous folds, in which, if the operation of dividing them by internal section had been made, the obstruction could have been readily and permanently removed.

Contra-indications. — The operation of internal œsophagotomy is contra-indicated in all cases where the walls of the stricture are atrophied or contracted so as to greatly reduce the external circumference of the œsophagus, or where the narrowing of the tube is produced by diseased conditions located in the walls or by pressure from without.

It is especially contra-indicated in cancerous contractions. It is equally true, here as elsewhere, that when a cancerous tumor cannot be completely extirpated, the use of the knife only goads it to a more rapid growth.

Dangers attending the operation. — As accidents are liable to occur in every operation, either during or after the performance, an understanding of them will the more readily enable us to prevent them.

The complications which have been thus far observed to attend or follow this operation are cutting through the wall of the œsophagus, hemorrhage, pain, pneumonia, dyspnœa, emphysema, and œsophagitis.

The greatest danger attending the operation is that of cutting too deeply and penetrating through the wall of the œsophagus, and the escape of blood and other substances into the surrounding parts, and the consequent formation of peri-œsophageal, mediastinal, or pleural abscess, which is inevitably fatal.

Hemorrhage. — In nearly all cases the hemorrhage was so inconsiderable as only to tinge the saliva. In the first patient operated on by the writer there was

slight hemorrhage, which continued for two or three hours, but subsided spontaneously and did not recur.

Hemorrhage may, however, prove a serious complication, as it did in the cases of Trélat and Schiltz. This was undoubtedly due to the unnecessary depth of the incision, and the wounding of an arterial branch leading into the stricture that had become enlarged in consequence of the diseased action going on in the morbid tissues of the stricture, rather than simply to incising the œsophageal wall, as in both instances in which this accident occurred there was almost entire absence of hemorrhage.

In the one by Trélat, he had made two incisions which gave him an opening of from ten to eleven millimetres. He now sharpened the blades to the point, and opened them two centimetres on making the incision. A glassful of blood was immediately lost, and followed next day by bloody stools.

On the twelfth day after, secondary hemorrhage occurred from straining at stool, and again on the thirteenth day, losing in the aggregate, it was estimated, four hundred grammes.

Braun¹ considers that the last operation was quite unnecessary as the nutrition of the patient could have been very well accomplished through an œsophagus whose lumen was from ten to eleven millimetres, which was present before the third incision was made.

Bearing on this point Trélat² remarks that it is the surface of the stricture rather than the diameter that is to be compared. When a stricture is enlarged from eight to twelve millimetres, the diameters are in a ratio of eight to twelve, while that between the surfaces is as four to nine.

In the second case by Schiltz, quite profuse hemorrhage occurred, which lasted five hours and could not be controlled by chloride of iron or by sounds retained *in situ*.

Pain.—Excepting the second case of Schiltz the operation in every instance was painless—so much so that an anæsthetic was entirely unnecessary, though one was administered by Czerny. In the case of Schiltz it was evidently due, either to the

¹ Braun : Czerny's Beiträge, Loc. cit., p. 89. ² Trélat : Loc. cit.

unnecessary depth of the incision or to an extremely sensitive or neuralgic condition of the œsophagus.

Pneumonia is a complication which may arise as a direct result of a wound inflicted on a part so closely contiguous to the lungs as the œsophagus. In the case in which it occurred—Mackenzie's—it was produced evidently by the pleuritis resulting from the incision through the œsophageal walls.

Œsophagitis.—More or less œsophagitis may also be occasioned by the incision, as was observed in Trélat's case, though it quite readily subsided on the withdrawal of all irritants.

Dyspnœa is a more rare complication, as it has occurred in but one case, that of Studsgaard. It was here evidently due to distention of the œsophagus by blood, as it was immediately relieved by vomiting, and the unloading of the œsophagus. The dyspnœa from distention of the œsophagus being produced either by direct pressure against the trachea or by pressure on the pneumogastric nerve, causing by reflex irritation spasm of the larynx, as so frequently occurs when foreign bodies have become lodged in the œsophagus.

Emphysema is also an infrequent complication, as it was only observed in Czerny's case.

This was certainly caused by air entering the cellular tissue through the opening in the œsophagus made by the incision and the violent vomiting after the operation. It could not have been due to injury to the lungs, as the lung-tissue cannot be easily reached by a vertical incision directly through the posterior wall of the œsophagus.

Emphysema is a phenomenon which also sometimes occurs, from the lodgment of foreign bodies in the œsophagus and from violent vomiting. An interesting case has been recently reported in which emphysema of the face, neck, and chest, followed the lodgment of a piece of pork in the œsophagus.¹

A case similar is also cited by Poulet.² For emphysema to occur in such cases Poulet states that

¹ Morgan, W. Lewis: Foreign Body in the Œsophagus, followed by Surgical Emphysema. London Lancet, April 8, 1882, p. 565.

² Poulet, A.: Foreign Bodies in Surgery, vol. i., p. 79. Wood's Library, 1889.

the mucous membrane must be perforated to place the cellular tissue in communication with the air, most frequently by means of a communication with the trachea.

From an analytical review of these cases the following deductions can be drawn :

First.—That the operation of internal œsophagotomy for the division and removal of the membranous or cicatricial constrictions or obstructions in the œsophagus is established beyond question as a justifiable operation ; and in all cases where it is clearly indicated it is the only warrantable operation for relief against impending starvation.

Second.—That it is a safer operation in its immediate results, and is attended by fewer complications than external œsophagotomy or gastrotomy.

Third.—Notwithstanding that it is a safer operation than external œsophagotomy or gastrotomy, when done with equal care and skill, it is one requiring great care and oftentimes the utmost surgical and manipulative dexterity, for the careless and reckless performance of it, even in the most favorable cases, would at once lead to the most serious consequences.

Fourth.—That it is an operation applicable to strictures in every region of the œsophagus, whereas external œsophagotomy is only applicable to those located in the region above the sternum.

Fifth.—That, as in external œsophagotomy and gastrotomy, it is an operation to be undertaken only when dilatation of the stricture has failed.

Sixth.—That success in this operation means a permanent relief to the patient and cure of the stricture. The restoration of the œsophagus to a normal condition rendering alimentation normal and leading at once to comfort and freedom from annoyance, whereas success in œsophagotomy or gastrotomy necessarily means a life of continued torment, the patient being in constant danger of the most serious complications and unfavorable terminations.

Seventh.—That the operation does not dispense with the use of the sound, but renders its use rapidly effective.



Eighth.—That it is inadmissible in strictures through which an opening cannot be found.

Ninth.—That it is contra-indicated in every instance in which the obstruction is cancerous or of a malignant nature, or caused by conditions external to the lumen of the œsophagus; where the walls are greatly atrophied, thinned or indurated; and where internal urethrotomy would be impracticable under like conditions of the urethra

A foot note, referring to two unpublished cases of successful internal œsophagotomy which were mentioned (without particulars) by Dr. Louis Elsberg in his remarks following the reading of that part of this paper which was read before the New York State Medical Society, was accidentally omitted in the publication of this article. Dr. Elsberg has since published his cases in full in the Archives of Laryngology, January, 1883.

